

CBSE EXAMINATION PAPER-2024

SCIENCE

(Solved)

Time allowed : 3 hours

Maximum Marks : 53

General Instructions :

Read the following instructions carefully and follow them :

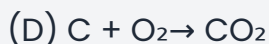
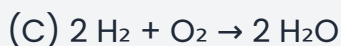
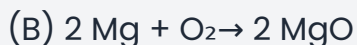
- i. This question paper contains **32 questions**. All questions are **compulsory**.
- ii. This question paper is divided into **5 sections**.
- iii. **Section A** – questions number **1 to 14** are multiple choice questions Each question carries **1 marks**.
- iv. **Section B** – questions number **15 to 22** are very short answer Each question carries **2 marks**.
- v. **Section C** – questions number **23 to 28** are short answer Each question carries **3 marks**.
- vi. **Section D** – questions number **29 to 31** are case based questions
- vii. **Section E** – questions number **32 to 32** are long answer Each question carries **5 marks**.
- viii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.
- ix. Use of calculator is NOT allowed.

Section A

Question 1.

Which of the following is a redox reaction, but not a combination reaction?

[1 Marks]



Explanation: A redox reaction involves both oxidation and reduction occurring simultaneously. A combination reaction is one where two or more reactants combine to form a single product. The first three options are combination reactions where elements or simple molecules combine to form one compound, and all are redox reactions. The fourth option, $\text{Fe}_2\text{O}_3 + 3 \text{CO} \rightarrow 2 \text{Fe} + 3 \text{CO}_2$, is a redox reaction where iron(III) oxide is reduced to iron and carbon monoxide is oxidized to carbon dioxide, but it is not a combination reaction because multiple products are formed.

Question 2. The salt present in tooth enamel is:

[1 Marks]

(A) Calcium phosphate

(B) Sodium phosphate

(C) Aluminium phosphate

(D) Magnesium phosphate

Explanation: The correct answer is 'Calcium phosphate' because tooth enamel is primarily composed of hydroxyapatite, which is a crystalline structure of calcium phosphate. This mineral provides strength and hardness to teeth.

Question 3. An aqueous solution of sodium chloride is prepared in distilled water. The pH of this solution is:

[1 Marks]

(A) 7

(B) 8

(C) 3

(D) 6

Explanation: The correct answer is 7, as sodium chloride (NaCl) is a neutral salt formed from the strong acid hydrochloric acid (HCl) and the strong base sodium hydroxide (NaOH). When dissolved in distilled water, it does not affect the pH significantly, which remains around 7, indicating a neutral solution.

Question 4.

Select from the following the conditions responsible for the rapid spread of bread mould on a slice of bread:

- (i) Formation of large number of spores
- (ii) Presence of moisture and nutrients in bread
- (iii) Low temperature
- (iv) Presence of hyphae

[1 Marks]

(A) (iii) and (iv)

(B) (ii) and (iii)

(C) (ii) and (iv)

(D) (i) and (ii)

Explanation: The correct conditions responsible for the rapid spread of bread mould are (i) Formation of large number of spores and (ii) Presence of moisture and nutrients in bread. Bread mould spreads quickly because fungi produce a large number of spores which are tiny reproductive units that can grow into new fungi when conditions are favorable. Bread provides moisture and nutrients that help the fungus grow and spread. Low temperature is not favorable for growth, and although hyphae are part of the fungus structure, they do not directly cause the rapid spread like spores and moisture do.

Question 5. The process in which transport of soluble products of photosynthesis takes place in plants is known as:

[1 Marks]

(A) Transpiration

(B) Evaporation

(C) Translocation

(D) Conduction

Explanation: The correct answer is 'Translocation' because it refers to the process by which the soluble products of photosynthesis, such as sugars and amino acids, are transported from the leaves (where they are produced) to other parts of the plant, specifically through the vascular tissue known as phloem.

Question 6. Sense organ in which olfactory receptors are present is:

[1 Marks]

(A) Nose

(B) Skin

(C) Tongue

(D) Inner ear

Explanation: The correct answer is 'Nose' because olfactory receptors, which are responsible for the sense of smell, are present in the nasal cavity. This is supported by the context which states that 'olfactory receptors will detect smell,' indicating that they are located in the nose.

Question 7. The incorrect statement about placenta is:

[1 Marks]

(A) It is a disc embedded in the uterine wall.

(B) It has a very small surface area for glucose and oxygen to pass from mother to the embryo.

(C) The embryo gets nutrition from the mother.

(D) It is formed only during pregnancy.

Explanation: The correct answer is 'It has a very small surface area for glucose and oxygen to pass from mother to the embryo.' This statement is incorrect because the context clearly states that the placenta provides a large surface area for glucose and oxygen to pass from the mother to the embryo, enabling effective nutrient transfer.

Question 8. How will the image formed by a convex lens be affected, if the upper half of the lens is wrapped with a black paper?

[1 Marks]

(A) The size of the image formed will be one-half of the size of the image due to the complete lens.

(B) The image of the upper half of the object will not be formed.

(C) The brightness of the image will reduce.

(D) The lower half of the inverted image will not be formed.

Explanation: When the upper half of a convex lens is covered, the lens still forms the complete image because every part of the lens contributes to the formation of the whole image. However, since less light passes through the lens, the brightness of the image decreases. The size and the nature of the image remain unchanged.

Question 9.

The phenomena of light involved in the formation of rainbow are:

[1 Marks]

- (A) Refraction, reflection and dispersion
- (B) Refraction, dispersion, scattering and total internal reflection
- (C) Refraction, dispersion and internal reflection**
- (D) Reflection, dispersion and internal reflection

Explanation: The correct option is 'Refraction, dispersion and internal reflection'. When sunlight enters a raindrop, it first bends due to refraction. Inside the raindrop, the light undergoes internal reflection off the water-air boundary. Finally, as the light exits the raindrop, it again refracts and disperses into its component colors, producing the rainbow. These three phenomena—refraction, dispersion, and internal reflection—together cause the formation of a rainbow.

Question 10. The colour of light for which the refractive index of glass is minimum, is:

[1 Marks]

- (A) Yellow
- (B) Red**
- (C) Green
- (D) Violet

Explanation: The correct answer is Red. In the visible spectrum, red light has the longest wavelength and, as a result, it experiences the least bending when passing through materials like glass. This means that the refractive index for red light is lower compared to other colors such as violet, which has a shorter wavelength and a higher refractive index.

Question 11. The current-carrying device which produces a magnetic field similar to that of a bar magnet is:

[1 Marks]

- (A) A straight conductor

(B) A circular loop

(C) A circular coil

(D) A solenoid

Explanation: The correct answer is 'A solenoid'. A solenoid is a coil of many circular turns of insulated wire, and when current passes through it, the magnetic field produced is similar to that of a bar magnet, with a distinct north and south pole. This is supported by the context provided, which specifically mentions the magnetic field pattern of a solenoid resembling that of a bar magnet.

Question 12.

A uniform magnetic field exists in the plane of paper as shown in the diagram. In this field, an electron

(e^-) and a positron (p^+) enter and shown. The electron and positron experience forces:

[1 Marks]

(A) both pointing into the plane of the paper.

(B) both pointing out of the plane of the paper.

(C) pointing into the plane of the paper and out of the plane of the paper respectively.

(D) pointing out of the plane of the paper and into the plane of the paper respectively.

Explanation:

The correct answer is 'pointing out of the plane of the paper and into the plane of the paper respectively.' This is because the electron, having a negative charge, will experience a force that is directed opposite to that of a positively charged particle (the positron) when they enter a magnetic field at right angles. According to Fleming's left-hand rule, the force direction for the electron will be into the page while for the positron it will be out of the page.

Question 13. Which one of the following is not a natural ecosystem?

[1 Marks]

(A) Pond ecosystem

(B) Grassland ecosystem

(C) Forest ecosystem

(D) Cropland ecosystem

Explanation: The correct answer is 'Cropland ecosystem' because according to the provided context, natural ecosystems include forests, ponds, and grasslands, while gardens and crop-fields are identified as humanmade (artificial) ecosystems.

Question 14. A metal 'X' is used in thermit process. When 'X' is heated with oxygen, it gives an oxide 'Y', which is amphoteric in nature. 'X' and 'Y' respectively are :

[1 Marks]

(A) Mn, MnO₂

(B) Mg, MgO

(C) Al, Al₂O₃

(D) Fe, Fe₂O₃

Explanation: In the thermit process, aluminium (Al) is the metal used. When aluminium reacts with oxygen, it forms aluminium oxide (Al₂O₃), which is amphoteric in nature. Amphoteric oxides can react with both acids and bases, as shown by the reactions of Al₂O₃ with HCl and NaOH. The thermit reaction involves aluminium reducing iron(III) oxide to iron, while aluminium itself is oxidised to aluminium oxide.

Section B

Question 15.

Copper powder is taken in a china dish and heated over a burner. Name the product formed and state its colour. Write the chemical equation for the reaction involved.

[2 Marks]

Answer: (a) Product formed: Copper oxide (CuO)

(b) Colour of the product: Black

(c) Chemical equation: $2\text{Cu} + \text{O}_2 \xrightarrow{\text{heat}} 2\text{CuO}$

Explanation: When copper powder is heated in presence of oxygen from the air, it reacts to form copper oxide which is black in colour. This is a chemical change where copper metal reacts with oxygen gas to form copper oxide.

Question 16. The melting and boiling points of carbon compounds are generally low and they are largely non-conductors of electricity. State two conclusions based on these two properties.

[2 Marks]

Answer: The low melting and boiling points of carbon compounds indicate that the forces of attraction between their molecules are weak. This means that these compounds do not require much energy to change their state from solid to liquid or liquid to gas. Additionally, since carbon compounds are largely non-conductors of electricity, it shows that they do not have free charged particles like ions or electrons to carry electric current. This is because their atoms are bonded covalently and electrons are shared, not transferred.

Question 17. Sometimes while running, the athletes suffer from muscle cramps. Why? How is respiration in this case different from aerobic respiration?

[2 Marks]

Answer: Athletes suffer from muscle cramps during running because their muscles sometimes respire anaerobically due to insufficient oxygen supply. During intense exercise, muscles require more energy than what aerobic respiration can provide, and oxygen becomes scarce. Anaerobic respiration breaks down glucose partially to produce energy and lactic acid. The buildup of lactic acid causes muscle cramps. Unlike aerobic respiration, which fully breaks down glucose using oxygen to release more energy, anaerobic respiration happens without oxygen and produces less energy along with lactic acid.

Question 18. Write the other name given to lymph. State its two functions.

[2 Marks]

Answer: The other name given to lymph is tissue fluid. Two functions of lymph are: 1) It carries digested and absorbed fats from the intestine to the bloodstream. 2) It drains excess fluid from the spaces around the tissues back into the blood, helping to maintain fluid balance in the body.

Question 19. Some unicellular organisms such as Plasmodium and Leishmania differ in the manner in which they reproduce. Name and explain the reproductive process taking place in them.

[2 Marks]

Answer: Plasmodium reproduces through multiple fission, a process where the organism divides into many daughter cells simultaneously, especially during unfavorable conditions. Conversely, Leishmania reproduces via binary fission, where the cell divides into two daughter cells in a specific orientation, often guided by its whip-like structure. This distinct method allows each organism to adapt and thrive in their respective environments efficiently.

Question 20.

The heat produced at a point due to concentration of sunlight by a convex lens burns a paper. (a) Explain why it happens. (b) Name the term given to the point at which the paper starts burning.

[2 Marks]

Answer: (a) When sunlight, which consists of parallel rays, passes through a convex lens, the lens converges these rays to a single point. This concentration of light energy at that point produces heat, which is sufficient to burn the paper. (b) The point at which the rays converge and the paper starts burning is called the 'focus' of the convex lens.

Question 21. An electric source can supply a charge of 500 coulomb. If the current drawn by a device is 25 mA, find the time in which the electric source will be discharged completely.

[2 Marks]

Answer: Given the total charge $Q = 500$ coulombs and current $I = 25 \text{ mA} = 0.025 \text{ A}$. We know that current $I = \text{charge } Q \text{ divided by time } t$, so $t = Q/I$. Substituting the values, $t = 500 / 0.025 = 20000$ seconds. Thus, the electric source will be discharged completely in 20000 seconds or approximately 5 hours 33 minutes.

Question 22.

Write chemical equation for the chemical reaction which occurs when the aqueous solutions of barium chloride and sodium sulphate react together. Write the symbols of the ions present in the compound precipitated in the reaction.

[2 Marks]

Answer: When aqueous solutions of barium chloride (BaCl_2) and sodium sulphate (Na_2SO_4) are mixed, a double displacement reaction occurs. Barium ions (Ba^{2+}) react with sulphate ions (SO_4^{2-}) to form barium sulphate (BaSO_4), which is an insoluble white solid precipitate. The balanced chemical equation is: $\text{BaCl}_2 (\text{aq}) + \text{Na}_2\text{SO}_4 (\text{aq}) \rightarrow \text{BaSO}_4 (\text{s}) + 2\text{NaCl} (\text{aq})$. The precipitate formed contains barium ions (Ba^{2+}) and sulphate ions (SO_4^{2-}).

Section C

Question 23. Study the experimental set-up shown in the diagram and write the chemical equation for the chemical reaction involved. Name and define the type of reaction. List two other metals which can be used in place of iron to show the same type of reaction with copper sulphate solution.

[3 Marks]

Answer: (a) The chemical equation for the reaction is: $\text{Fe} (\text{s}) + \text{CuSO}_4 (\text{aq}) \rightarrow \text{FeSO}_4 (\text{aq}) + \text{Cu} (\text{s})$. Here, solid iron reacts with aqueous copper sulphate solution to form aqueous iron sulphate and solid copper.

(b) This reaction is called a displacement reaction. It occurs when a more reactive metal displaces a less reactive metal from its salt solution.

(c) Two other metals which can be used in place of iron to show the same type of reaction with copper sulphate solution are zinc (Zn) and aluminium (Al). Both these metals are more reactive than copper and can displace copper from copper sulphate solution.

Question 24. Name the ore of mercury and state the form in which it is found in nature. Write the chemical equations along with the conditions required for the reactions involved in the extraction of mercury from its ore.

[3 Marks]

Answer: (a) The ore of mercury is cinnabar, which is mercury sulfide (HgS). It is found in nature as an insoluble red mineral.

(b) Mercury is extracted from cinnabar by roasting it in the presence of oxygen. The first reaction involves heating mercury sulfide in air to form mercury oxide and sulfur dioxide: $2\text{HgS}(s) + 3\text{O}_2(g) \xrightarrow{\text{Heat}} 2\text{HgO}(s) + 2\text{SO}_2(g)$. This reaction requires heating in air to provide oxygen.

(c) The second reaction involves the thermal decomposition of mercury oxide to produce liquid mercury and oxygen gas: $2\text{HgO}(s) \xrightarrow{\text{Heat}} 2\text{Hg}(l) + \text{O}_2(g)$. This reaction also requires heating.

Thus, mercury is obtained by heating cinnabar in air, which converts HgS first to HgO and then to metallic mercury.

Question 25. Taking the example of any two animal hormones along with their gland of secretion, explain how these hormones help (i) in growth and development and (ii) regulate metabolism, in the body.

[3 Marks]

Answer: Two important animal hormones are Growth Hormone (GH) and Insulin. GH is secreted by the anterior pituitary gland and plays a crucial role in growth and development. It stimulates tissue growth, increases cell size, and promotes the synthesis of proteins, ensuring the development of bones and muscles during childhood. On the other hand, Insulin is produced by the pancreas and regulates metabolism by controlling glucose levels in the blood. It facilitates the uptake of glucose by cells for energy production, thus maintaining metabolic balance and ensuring proper growth. Both hormones are vital, as GH supports bodily growth, while Insulin ensures efficient energy utilization, which is essential for sustaining growth and function.

Question 26. Study the diagram given below and answer the questions that follow: (i) Name the defect of vision depicted in this diagram stating the part of the eye responsible for this condition. (ii) List two causes of this defect. (iii) Name the type of lens used to correct this defect and state its role in this case.

[3 Marks]

Answer: (i) The defect of vision shown in the diagram is Myopia or near-sightedness. It occurs because the image of a distant object is focused in front of the retina instead of on

it. This happens when the eyeball is too long or the eye lens has excessive curvature.

(ii) Two causes of myopia are: (1) elongation of the eyeball, which makes the distance between the lens and retina longer than normal, (2) excessive curvature of the eye lens, which decreases its focal length.

(iii) Myopia is corrected by using a concave lens (diverging lens). The concave lens diverges the light rays before they enter the eye so that they focus properly on the retina, thus forming a clear image of distant objects.

Question 27. Differentiate between food chain and food web. In a food chain consisting of deer, grass, and tiger, if the population of deer decreases, what will happen to the population of organisms belonging to the first and third trophic levels?

[3 Marks]

Answer: A food chain represents a linear sequence of energy transfer through trophic levels, while a food web encompasses interconnected food chains illustrating feeding relationships within an ecosystem. In the context of a chain involving grass (producers), deer (primary consumers), and tigers (tertiary consumers), a decrease in the deer population would mean that the primary consumers (deer) have less food, likely leading to their potential decline. Consequently, the population of tigers, which rely on deer for sustenance, would also decrease due to less available prey, showing the interconnectedness of trophic levels within an ecosystem.

Question 28.

What is dispersion of white light ? State its cause. Draw a diagram to show dispersion of a beam of white light by a glass prism.

[3 Marks]

Answer: Dispersion of white light is the phenomenon in which white light splits into its constituent colors when it passes through a prism. This happens because white light is made up of many colors mixed together. When white light enters the glass prism from air, it slows down and bends due to refraction. Different colors have different wavelengths and therefore bend by different amounts inside the prism. This difference in bending causes the white light to spread out and form a spectrum of colors ranging from red to violet. The cause of dispersion is that various colors of light refract differently because of their different wavelengths. Below is a simple diagram showing the dispersion of white light by a glass prism.

Section D

Question 29. Carbon is a versatile element that forms the basis of all living organisms and many of the things we use. A large variety of compounds is formed because of its

tetravalency. Compounds of carbon are formed with oxygen, hydrogen, nitrogen, sulphur, chlorine and many other elements.

(1) What are hydrocarbons?

[1 Marks]

Answer: Hydrocarbons are compounds made up of only carbon and hydrogen atoms.

Key Points: Hydrocarbons contain only carbon and hydrogen atoms - Carbon forms bonds with hydrogen in these compounds - Hydrocarbons are the simplest carbon compounds - They form the basis for many other carbon compounds

(2) List two properties by virtue of which carbon can form a large number of compounds.

[1 Marks]

Answer: Two important properties of carbon that allow it to form a large number of compounds are: 1) Catenation: Carbon can form strong bonds with other carbon atoms creating long chains, branched chains or rings. 2) Tetravalency: Carbon has four valence electrons which enable it to form covalent bonds with up to four other atoms including atoms of different elements, resulting in a variety of stable compounds.

Key Points: Catenation-Tetravalency-Strong covalent bonds and stability of compounds due to carbon's small size

(3) Write the formula of the functional group present in (1) aldehydes, and (2) ketones. Write a chemical equation for the reaction that occurs between ethanoic acid and ethanol in the presence of a catalyst.

[2 Marks]

Answer: 1) The functional group present in aldehydes is the aldehyde group with the formula $-\text{CHO}$. 2) The functional group present in ketones is the keto group with the formula $-\text{CO}-$. The reaction between ethanoic acid and ethanol in the presence of a catalyst (usually concentrated sulfuric acid) is called esterification. They react to form

an ester, ethyl ethanoate, and water. The chemical equation is: Ethanoic acid + Ethanol → Ethyl ethanoate + Water $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \rightarrow \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$

Key Points: Functional group in aldehydes is $-\text{CHO}$ -The functional group in ketones is $-\text{CO}-$ -Reaction between ethanoic acid and ethanol forms an ester called ethyl ethanoate- Catalyst is usually concentrated sulfuric acid- General esterification reaction involves acid + alcohol → ester + water

(4)

What are structural isomers? Write the structures of two isomers of butane (C_4H_{10})

[2 Marks]

Answer: Structural isomers are compounds that have the same molecular formula but different arrangements of atoms. In other words, they differ in how the carbon atoms are connected to each other. For example, two isomers of butane (C_4H_{10}) are: 1. n-Butane: A straight chain of four carbon atoms connected one after another ($\text{C}-\text{C}-\text{C}-\text{C}$), with hydrogen atoms filling the remaining bonds. 2. Isobutane (or methylpropane): A branched chain where three carbon atoms form a chain and the fourth carbon is attached to the middle carbon atom, creating a branch. These two have the same molecular formula but different structures, resulting in different properties.

Key Points: Definition of structural isomers-Same molecular formula but different atomic arrangement-Example of n-butane (straight chain) and isobutane (branched chain)-Explain difference in carbon skeleton

Question 30. Pollination is an important process in sexual reproduction of plants. It is an essential process that facilitates fertilisation in plants. Pollinating agents can be wind, water, insects and birds. Several changes take place in the flower after the fertilization has taken place.

(1) Name the part of the flower which attracts insects for pollination. What happens to this part after fertilisation?

[1 Marks]

Answer: The part of the flower that attracts insects for pollination is the petals. After fertilization occurs, the petals usually wither and may fall off as the plant focuses on developing the fertilized ovule into a seed.

Key Points: 1. Petals attract pollinators; 2. Petals may wither after fertilization; 3. Focus shifts to seed development

(2) Write the main difference between self-pollination and cross-pollination.

[1 Marks]

Answer: The main difference between self-pollination and cross-pollination is that self-pollination occurs when pollen is transferred from the anthers to the stigma of the same flower, while cross-pollination occurs when pollen is transferred from the anthers of one flower to the stigma of a different flower.

Key Points: Self-pollination occurs within the same flower; Cross-pollination occurs between different flowers; Agents of cross-pollination include wind, water, and animals.

(3) Define fertilisation. What is the fate of ovules and the ovary in a flower after fertilisation?

[2 Marks]

Answer: Fertilisation is the process where the sperm and ovum fuse, resulting in the formation of a zygote. After fertilisation, the ovules develop into seeds, and the ovary transforms into a fruit, protecting the developing seeds and aiding in their dispersal.

Key Points: Fertilisation is sperm-ovum fusion; Ovules become seeds; Ovary becomes fruit

(4)

In a germinating seed, which parts are known as future shoot and future root? Mention the function of cotyledon.

[2 Marks]

Answer: In a germinating seed, the part that develops into the future shoot is known as the 'plumule' and the part that develops into the future root is called the 'radicle.' The cotyledon serves the important function of storing food for the developing embryo, providing necessary nutrients until the seedling can produce its own food through photosynthesis.

Key Points: plumule-radicle-cotyledon function

Question 31.

A highly polished surface such as a mirror reflects most of the light falling on it. In our daily life we use two types of mirrors plane and spherical. The reflecting surface of a spherical mirrors may be curved inwards or outwards. In concave mirrors, reflection takes place from the inner surface, while in convex mirrors reflection takes place from the outer surface.

(1) A ray of light is incident on a concave mirror, parallel to its principal axis. If this ray after reflection from the mirror passes through the principal axis from a point at a distance of 10 cm from the pole of the mirror, find the radius of curvature of the mirror.

[1 Marks]

Answer: When a ray of light is incident parallel to the principal axis of a concave mirror, it passes through the focus after reflection. Given that the ray passes through a point 10 cm from the pole, this point is the focus (f) of the mirror. The radius of curvature (R) of a concave mirror is twice the focal length, so $R = 2 \times 10 \text{ cm} = 20 \text{ cm}$. Therefore, the radius of curvature of the mirror is 20 cm.

Key Points: concave mirror-reflecting surface curved inward-ray parallel to principal axis passes through focus-focal length equals 10 cm-radius of curvature equals twice the focal length-radius of curvature is 20 cm

(2) Define the principal axis of a concave mirror.

[1 Marks]

Answer: The principal axis of a concave mirror is an imaginary straight line that passes through the center of the mirror and its pole, and is perpendicular to the surface of the mirror.

Key Points: Principal axis is an imaginary straight line–It passes through the center and pole of the mirror–It is perpendicular to the mirror's surface

(3) An object is placed at a distance of 10 cm from the pole of a convex mirror of focal length 15 cm. Find the position of the image.

[2 Marks]

Answer: Given data: Object distance, $u = -10$ cm (The object is always placed in front of the mirror, so u is negative) Focal length of convex mirror, $f = +15$ cm (For convex mirrors, focal length is positive) Using the mirror formula: $1/f = 1/v + 1/u \Rightarrow 1/v = 1/f - 1/u \Rightarrow 1/v = 1/15 - 1/(-10) \Rightarrow 1/v = 1/15 + 1/10 \Rightarrow 1/v = (2 + 3)/30 = 5/30 = 1/6$ Therefore, $v = 6$ cm. So, the image is formed at a distance of 6 cm behind the mirror.

Key Points: Define focal length for convex mirror–Use sign conventions (u negative, f positive)–Apply mirror formula $1/f = 1/v + 1/u$ –Calculate image distance v –Interpret positive v as virtual image formed behind mirror

(4)

A mirror forms a virtual, erect and diminished image of an object. Identify the type of this mirror. Draw a ray diagram to show the image formation in this case.

[2 Marks]

Answer: The mirror that forms a virtual, erect and diminished image of an object is a convex mirror. In a convex mirror, the reflective surface curves outward, and it always forms a virtual, erect and diminished image irrespective of the position of the object. [Here, draw a ray diagram showing an object in front of a convex mirror, with parallel rays reflecting and appearing to come from the focal point behind the mirror, and the image formed behind the mirror, smaller and upright.]

Key Points: Type of mirror is convex mirror–Convex mirror has a reflective surface curved outwards–Always forms a virtual, erect and diminished image–Image

formed behind the mirror-Ray diagram should show the reflection and image formation

Section E

Question 32. Design an experiment to demonstrate that carbon dioxide is essential for photosynthesis. Write the observation and conclusion of the experiment.

[5 Marks]

Answer: Experiment to prove that carbon dioxide is essential for photosynthesis:

(a) Take two potted plants of the same type and size. Cover one plant with a plastic bag containing some soda lime or potassium hydroxide which absorbs carbon dioxide, and keep the other plant uncovered as a control.

(b) Place both plants in sunlight for a few hours.

(c) After some time, test the leaves of both plants for the presence of starch by using iodine solution after boiling the leaves in alcohol and then in water.

Observation: The uncovered plant shows a blue-black color indicating the presence of starch, while the plant covered with soda lime shows no blue-black color, indicating no starch formation.

Conclusion: Carbon dioxide is essential for photosynthesis because the plant deprived of CO_2 was unable to prepare food, as shown by the absence of starch in its leaves. Hence, photosynthesis requires carbon dioxide to occur.
